

# Observations of gonad structure and gametogenic timing in a recovering population of Olympia oysters

Mark Oates, Oregon Institute of Marine Biology

## Project Title:

A collaborative approach to address reproduction, larval supplies, and settlement during recovery of native Olympia oysters

## Location:

Coos Bay, Oregon

## Goal:

Generate new science to support development of a conservation and recovery plan for Olympia oyster populations throughout Coos Bay

## Partners:

Oregon Institute of Marine Biology; South Slough National Estuarine Research Reserve; Oregon State University; Oregon Sea Grant; Oregon Department of Fish and Wildlife

## Timeline:

Sep 2011 to Dec 2012

## Overview of reproduction:

Olympia oysters (*Ostrea lurida*) are protandrous hermaphrodites. As they mature, each individual begins life as a male, transitioning to female after the first spawning event. Individuals switch their gender after each successive spawning, alternating throughout their life cycle. Adult oysters release their gametes when environmental conditions are favorable, but most notably during seasonal increases in water temperature. Previous research indicates that  $\sim 15^{\circ}\text{C}$  is a critical threshold, and that reproduction is usually limited to late spring, summer, and early fall.



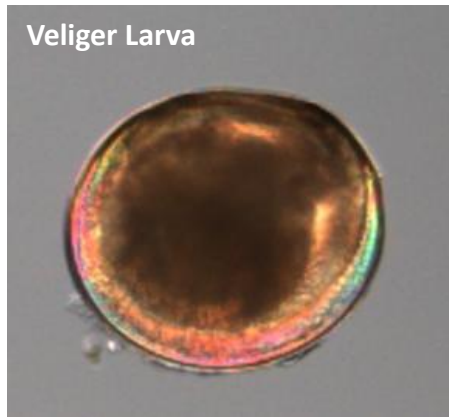
Brooding Female

Female Olympia oysters provide a measure of brood protection to their offspring. Male oysters release sperm clusters directly into the water, and they enter the gills of female oysters. Eggs are fertilized internally, and the developing embryos and early larval stages are retained within the shell cavity of the adult female. The brooded larvae develop within the mother's shell for a period of 7-14 days before they are released into the water in the form of swimming veligers. It is estimated that each brooding female may release up to 250,000 veliger larvae.

## Investigation of gametogenesis:

The process by which eggs and sperm develop within the ovaries and testes is known as gametogenesis. The gametogenic cycle of *O. lurida* was first described in the 1930s. However, information is very limited about the reproductive cycle of Olympia oyster populations within Coos Bay. Detailed information on gametogenesis and spawning is essential for conservation of Olympia oysters and for the design of effective restoration efforts. In particular, data to describe the timing of spawning, brooding behavior, fecundity, and other life-history traits are critical to develop management strategies to foster self-sustaining populations.

Veliger Larva



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## Stakeholder Involvement:

Stakeholders participate as members of the Olympia Oyster Recovery Advisory Committee. Input and issues raised by the stakeholder committee are used to help direct and guide the scientific work completed by graduate students and faculty at the Oregon Institute of Marine Biology.

## Support:

Financial support for the project is provided by a grant from the NOAA-NERRS Science Collaborative.

## Learn More:

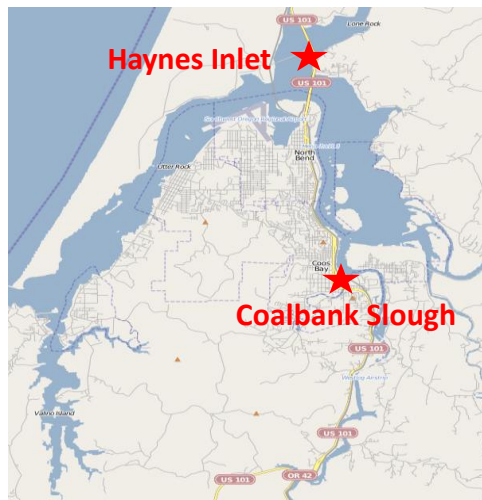
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## Oyster Sampling Sites:

Two sites within Coos Bay have been selected to follow the reproduction of Olympia oysters: Haynes Inlet and Coalbank Slough. Haynes Inlet is a rocky intertidal environment located in the northernmost region of the bay, adjacent to extensive beds of commercially cultured Pacific oysters (*Crassostrea gigas*). Olympia oysters are consistently found attached to the rip- and concrete lining the shore. The Coalbank Slough study site is located in the riverine region of Coos Bay, and is comprised of a mudflat environment. The Olympia oysters are primarily found in small clusters and larger aggregations of shells on wood debris and the muddy bottom.



Developing  
Egg Cells

## Gametogenic analysis:

Using paraffin histology techniques, thin sections of oyster gonad will be analyzed under a light microscope. Individuals will be observed for sexual phase (male, female or hermaphrodite) and degree of gonad development (e.g. early gametogenesis, ripe gonad, partially spawned). Measurements of egg sizes will be recorded for ovaries that contain developing eggs. Egg size will be the primary indicator to determine when oysters are reproductively mature and ready to spawn. In addition, brooded larvae will be collected and quantified to provide information on reproductive output.

## Anticipated results:

Gonad samples collected from July-September 2010 indicate a reproductive peak in early to mid August, followed by a reduction in follicle volume and gamete density in September. Evidence of larval brooding was also detected in August (1 individual) and September (2 individuals). Accounting for estimated brood time and planktonic larval duration, these results (suggesting spawning in early August), are in agreement with previous Coos Bay research suggesting a peak in larval settlement around mid-October.



Larvae within  
brood chamber